

REMARKS

The present invention relates to olefin branched macromonomers, olefin graft copolymers, and olefin resin compositions having the advantages of good compatibility with polyolefin resins and good moldability and workability.

As recited in above amended Claim 6, an elected invention is an olefin graft copolymer obtained by copolymerizing an atactic branched macromonomer, wherein the macromonomer is derived from monomers selected from the group consisting of (1) propylene and (2) the combination of propylene and at least one selected from ethylene, α -olefins having from 4 to 20 carbon atoms, cyclic olefins and styrenes, and of which the propylene content falls between 0.1 and 100 mol%, and which macromonomer satisfies the following (a) and (b):

(a) its weight-average molecular weight (M_w) measured through gel permeation chromatography (GPC) falls between 400 and 200000;

(b) its vinyl content is at least 70 mol% of all the unsaturated groups in the macromonomer, wherein the macromonomer satisfies each of the following (i), (ii) and (iii):

(i) the ratio of the temperature dependency (E_2) of the macromonomer solution viscosity to the temperature dependency (E_1) of the solution viscosity of the linear polymer which has the same type of monomer, the same chemical composition and the same intrinsic viscosity as those of the macromonomer, E_2/E_1 , satisfies the following relationship:

$$1.01 \leq E_2/E_1 \leq 2.5;$$

(ii) the ratio of the number-average molecular weight measured through GPC (GPC-Mn) to the number-average molecular weight measured through ^{13}C -NMR (NMR-Mn) of the macromonomer satisfies the following relationship:

$$(GPC\text{-Mn})/(NMR\text{-Mn}) \geq 1;$$

(iii) the macromonomer has branches existing not at the α - and/or β -substituents of the monomer that constitutes the macromonomer, and the number of the branches falls between 0.01 and 40 in one molecule of the macromonomer, with at least one comonomer selected from ethylene, propylene, α -olefins having from 4 to 20 carbon atoms, cyclic olefins and styrenes, in the presence of a metallocene catalyst.

As recited in above-amended Claim 15, an elected invention is also an olefin graft copolymer obtained by copolymerizing an atactic propylene macromonomer satisfying the following (a), (b) and (c):

(a) its weight-average molecular weight (M_w) measured through gel permeation chromatography (GPC) falls between 800 and 500000;

(b) its vinyl content is at least 70 mol% of all the unsaturated groups in the macromonomer;

(c) its propylene content falls between 50 and 100 mol%,

with at least one comonomer selected from ethylene, propylene, α -olefins having from 4 to 20 carbon atoms, cyclic olefins and styrenes, in the presence of a metallocene catalyst,

which olefin graft copolymer satisfies the following (1), (2), (3) and (4):

(1) its intrinsic viscosity $[\eta]$ measured in a solvent decalin at 135°C falls between 0.7 and 12 dl/g;

(2) the ratio of the weight-average molecular weight (M_w) to the number-average molecular weight (M_n) thereof measured through GPC, M_w/M_n , falls between 1.5 and 3.0;

(3) it contains from 0.01 to 40% by weight of repeat units derived from the propylene macromonomer;

(4) it has no terminal vinyl group in the olefin graft copolymer.

The rejection of Claims 6 and 8 under 35 U.S.C. § 102(e) as anticipated by U.S. 6,184,327 (Weng et al) in view of WO94/07930 (Brant et al)¹, is respectfully traversed. Weng et al discloses elastomeric propylene polymers disclosed as combining amorphous, atactic polypropylene backbones with high melting point, low molecular weight, isotactic or syndiotactic polypropylene sidechains (column 2, lines 32-36). In other words, Weng et al discloses incorporation of isotactic or syndiotactic polypropylene macromer into amorphous, atactic polypropylene backbones (paragraph bridging columns 2 and 3).

In the present Office Action, noting that Weng et al does not expressly indicate that their macromonomer contains branches, the Examiner now relies on Brant et al for the proposition that macromonomers prepared in the presence of metallocene catalysts are "linear long chain branched."

In reply, whether or not the above from Brant et al is correct as a general proposition, nevertheless, Weng et al neither discloses nor suggests an atactic branched macromonomer, as discussed above.

For all the above reasons, it is respectfully requested that the rejection over Weng et al be withdrawn.

The rejections of Claims 6 and 8 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over, and of Claim 15 under 35 U.S.C. § 103(a) as unpatentable over, WO98/55520 (Tatsumi et al), are respectfully traversed. (The U.S. equivalent thereof, i.e., U.S. 6,573,352 is relied on below for discussion purposes only.)

¹ That the new prior art (Brant et al) is not listed in the statement of the rejection is irrelevant; reliance thereon is all that is necessary. "Where a reference is relied on to support a rejection, whether or not in a 'minor capacity,' there would appear to be no excuse for not positively including the reference in the statement of rejection." *In re Hoch*, 166 USPQ 406, 407 n.3 (CCPA 1970). See also MPEP 706.02(j).

Tatsumi et al discloses various embodiments of long-chain, branched, propylene-based homopolymers and copolymers. The Examiner has assumed that the polymers of Tatsumi et al meet the terms of the present claims. In reply, Tatsumi et al neither discloses nor suggests an atactic branched macromonomer, nor an atactic propylene macromonomer, nor an olefin graft copolymer obtained by copolymerizing an atactic propylene macromonomer with at least one comonomer selected from ethylene, propylene, α -olefins having from 4 to 20 carbon atoms, cyclic olefins, and styrenes. In addition, the newly-submitted Machida Declaration shows that condition (i) of Claim 6 is not satisfied by Example 1 of Tatsumi et al. Thus, the Examiner's rationale that Tatsumi et al's polymers inherently meet the terms of the present claims must fail.

For all the above reasons, it is respectfully requested that the rejections over Tatsumi et al be withdrawn.

Applicants respectfully traverse the finality of the Office Action. The Examiner has made a new ground of rejection over Tatsumi et al. However, Tatsumi et al was brought to the attention of the Examiner by the Information Disclosure Statement (IDS) filed November 15, 2002. The Examiner did not make Tatsumi et al of record until the most recent Office Action, after Applicants called this omission to the Examiner's attention in the amendment filed February 27, 2004. In other words, if Tatsumi et al is relevant now, it was also relevant prior to the above amendment. Therefore, if the present amendment does not render the application allowable, then the Examiner is respectfully requested to withdraw the finality of the Office Action, and enter this amendment as a matter of right.

All of the presently pending and active claims in this application are now in immediate condition for allowance. The Examiner is respectfully requested to examine claims to the non-elected species, and in the absence of further grounds of rejection, pass this

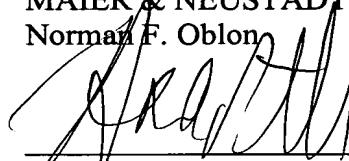
Application No. 10/019,293
Reply to Final Office Action dated April 23, 2004

application to issue with all such claims, as well as claims drawn to Group III of the restriction requirement, which claims contain the limitations of the allowed active claims.

Respectfully submitted,

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MAIER & NEUSTADT, P.C.

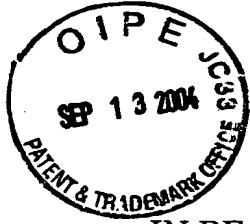
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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :

Shuji MACHIDA ET AL. : EXAMINER: LU, C. CAIXIA

SERIAL NO.: 10/019,293 :

FILED : JANUARY 4, 2002 : GROUP ART UNIT: 1713

FOR: BRANCHED OLEFINIC MACROMONOMER, OLEFIN GRAFT COPOLYMER, AND OLEFIN RESIN COMPOSITION OLEFIN-BASED POLYMER

DECLARATION UNDER 37 C.F.R. § 1.132

HONORABLE COMMISSIONER FOR PATENTS & TRADEMARKS
ALEXANDRIA, VIRGINIA 22313

SIR:

I, Shuji MACHIDA, of 1-1, Anesakikaigan, Ichihara-shi, Chiba-ken, Japan, declare that:

1. I graduated from the master Course in polymer-chemistry of Yamagata University in 1978, and entered Idemitsu Kosan Co., Ltd. in 1979. From 1980, I studied synthetic polymers and catalysts in Research Laboratory of Idemitsu Kosan Co., Ltd. From 1997, I have worked in Research Laboratory of Idemitsu Petrochemical Co., Ltd.
2. I am familiar with the subject matter disclosed in the above-identified application.
3. I have reviewed the Office Action mailed April 23, 2001, and note that the Examiner maintains the rejections based on Tatsumi et al. (U. S 6,573,352, corresponding application : WO 98/55520).

4. To examine whether the macromonomer of the cited reference meets the parameters recited in the claims of the above-identified application, I have prepared the macromonomer according to Example of the cited reference.

EXPERIMENT

(1-1) Experiment A (Example 1 of Tatsumi et al.)

In the same process as in Example 1 of Tatsumi et al, 42.5 g of a ethylene/propylene copolymerized macromonomer was obtained.

The weight-average molecular weight (Mw), the ethylene content, the terminal vinyl selectivity and the ratio of temperature dependency of solution viscosity (E2/E1) of the macromonomer obtained in the above were measured according to the methods mentioned in the specification of the above-identified application.

The results obtained are shown in Table I.

(1-2) Experiment B (Preparation of the standard Example)

The same process as in the above mentioned Experiment A was repeated, except that the amount of toluene used was 800 ml, bispentamethylcyclopentadienyl hafnium dichloride was replaced with cyclopentadienylzirconium dichloride mentioned in Comparative Example 1 of the above-identified application, the polymerization temperature was 90 °C, ethylene at a rate of 0.5 normal liters/min and propylene at a 5 normal liters/min were continuously fed into the autoclave at atmospheric pressure.

As a result, 12.5 g of a macromonomer was obtained herein. This was evaluated in the same manner as in Experiment A and its data are given in Table I.

Table I

	Details	Experiment A	Comp Experiment B
Resin Properties	Mw	7530	7400
	Ethylene Content (mol%)	66.8	70.0
	Terminal Vinyl Selectivity (%)	88.2	25.3
	Intrinsic Viscosity $[\eta]$ (dl/g)	0.110	0.105
	Relative Viscosity (75°C)	3.42	3.45
	Sample Concentration (g/dl)	13.00	13.05
	E_1	—	4.55×10^5
	E_2	4.50×10^5	—
	E_2/E_1	0.99	—

(2) Evaluation

From the Table I, the macromonomer of Tatsumi et al. fails to meet the claimed requirement $1.01 \leq E_2/E_1 \leq 2.5$.

6. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: September 7, 2004

Shuji Machida
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